

## **CLAIMS:**

1. In a method of producing blow-molded thermoplastic resin products that each have a mold parting-line perimeter and that each have the same particularly desired wall thickness configuration  
5 characteristic at the product mold parting-line perimeter, and of using: a cap blow-mold sub-assembly having a gutter flash clamping surface extending away from and surrounding the product mold parting-line perimeter; and a co-operating base blow-mold sub-assembly having multiple end-butting and pivoted gutter plate segments which together surround the product mold parting line perimeter and have gutter flash clamping surfaces which oppose and are spaced-apart from the cap blow-mold sub-assembly gutter flash clamping surface, the steps of:

producing a first blow-molded thermoplastic resin product having a wall thickness configuration characteristic at the product mold parting-line perimeter that is different than the particularly desired product wall thickness configuration using the cap blow-mold sub-assembly and the co-operating base blow-mold sub-assembly with a first separation distance separating the cap blow-mold sub-assembly gutter flash clamping surface from the base blow-mold sub-assembly pivoted gutter plate segment gutter flash clamping surfaces;

moving the base blow-mold sub-assembly multiple abutting and pivoted gutter plate segments relative to the cap blow-mold sub-assembly gutter flash clamping surface to thereby change the first separation distance between the gutter plate segment gutter flash clamping surfaces and the cap blow-mold sub-assembly substantially flat gutter flash clamping surface  
20 to a second separation distance; and

producing subsequent blow-molded thermoplastic resin products using the cap blow-

mold sub-assembly and co-operating base blow-mold sub-assembly with said second separation distance separating the cap blow-mold sub-assembly gutter flash clamping surface from the base blow-mold sub-assembly pivoted gutter plate segment gutter flash clamping surfaces to produce blow-molded thermoplastic resin products that each have the particularly desired wall thickness configuration characteristic at the product mold parting-line perimeter.

2. The method of producing a blow-molded thermoplastic resin product defined by claim 1 wherein the particularly desired wall thickness configuration characteristic at the product mold parting-line perimeter is an interiorly convex wall thickness configuration characteristic, and wherein said second separation distance is less than the first separation distance.

3. The method of producing a blow-molded thermoplastic resin product defined by claim 1 wherein the particularly desired wall thickness configuration characteristic at the product mold parting-line perimeter is an interiorly uniform wall thickness configuration characteristic, and wherein said second separation distance is less than the first separation distance.

4. The method of producing a blow-molded thermoplastic resin product defined by claim 1 wherein the particularly desired wall thickness configuration characteristic at the product mold parting-line perimeter is an interiorly concave wall thickness configuration characteristic, and wherein said second separation distance is greater than the first separation distance.

5. The method of producing a blow-molded thermoplastic resin product defined by claim 1 wherein the particularly desired wall thickness configuration characteristic at the product mold parting-line perimeter is an interiorly uniform wall thickness configuration characteristic, and wherein said second separation distance is equal to the first separation distance.

6. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold assembly, and comprising:

a cap blow-mold sub-assembly having a product cavity that is defined in-part by a cavity mold parting-line perimeter and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping surface extending outwardly from said product cavity mold parting-line perimeter;

a base blow-mold sub-assembly having a support structure, and having a product cavity that is carried by said support structure and that is defined in-part by a cavity mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

multiple base blow-mold sub-assembly elongate gutter plate segments that are each pivotable and movable relative to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-butted, that each have two, spaced-apart pivot connections each one of

which is positioned in a different one of the elongate gutter plate segment end regions, and that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface; and

multiple bi-directional actuators that are each supported by said base blow-mold sub-assembly support structure, that are each connected to a respective one of said elongate gutter plate segment pivot connections, and that are each actuated to cause pivoting of its respective one of said base elongate gutter plate segments in directions that are parallel to the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter to separate the integrally attached gutter flash surrounding the product from the product progressively along said base blow-mold assembly product cavity mold parting-line perimeter, said multiple elongate gutter plate segment pivot connections each having a longitudinal pivot axis oriented normal to the plane of said base blow-mold sub-assembly mold parting-line perimeter, and said multiple elongate gutter plate segment pivot connections each permitting its incorporating gutter plate segment to be rotated relative to said base blow-mold sub-assembly product cavity mold parting-line perimeter and to be translated linearly in directions that are parallel to said gutter plate segment pivot connection longitudinal axis.

7. The blow-mold assembly invention defined by claim 6, and wherein said multiple base blow-mold sub-assembly elongate gutter plate segments each have an excess gutter flash receiver element that is recessed in and open relative to the gutter plate segment gutter flash clamping surface.

8. The blow-mold assembly invention defined by claim 6, and wherein said cap blow-mold sub-assembly gutter flash clamping surface comprises a substantially flat and continuous surface extending away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter and with increasing gutter flash clamping surface angular departure away from said multiple elongate gutter plate segment gutter flash clamping surfaces.

9. The blow-mold assembly invention defined by claim 8, and wherein said cap blow-mold sub-assembly substantially flat gutter flash clamping surface increasing surface angular departure is at least approximately a one-degree ( $1^{\circ}$ ) or greater departure.

10. The blow-mold assembly invention defined by claim 6, and wherein said cap blow-mold sub-assembly surrounding gutter flash clamping surface comprises an otherwise substantially flat and continuous gutter flash clamping surface that has an intermediate offset step and that extends away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter with increasing gutter flash clamping surface angular departure away from said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

11. The blow-mold assembly invention defined by claim 6, and further comprising at least one transverse gutter flash separation blade element, one of said base blow-mold sub-assembly gutter

plate segments having a transverse gutter flash separation blade element located in one of said gutter plate segment end regions and adjacent an end-abutting gutter plate segment.

12. The blow-mold assembly invention defined by claim 6, and further comprising multiple traverse gutter flash separation blade elements, each said base blow-mold sub-assembly gutter plate segments having at least one of said multiple traverse gutter flash separating blade elements located in at least one gutter plate segment end region and adjacent an end-abutting gutter plate segment.

13. The blow-mold assembly invention defined by claim 7, and wherein said excess gutter flash receiver elements are each comprised of multiple, blind-hole, recesses provided in a respective one of said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

14. The blow-mold assembly invention defined by claim 7, and wherein said excess gutter flash receiver elements are each comprised of an elongated and continuous blind-slot that is recessed in a respective one of said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

15. The blow-mold assembly invention defined by claim 13 for use in a blow-molding machine that processes a heated thermoplastic resin parison that has descended parison zones of substantially different wall thickness to form a blow-molded hollow thermoplastic resin product, and wherein said gutter flash receiver element further comprises multiple blind-hole recesses that have a gutter flash clamping surface volume that is generally directly proportional to the wall thickness of the nearest blow-mold machine descended parison zone.

16. The blow-mold assembly invention defined by claim 14 for use in a blow-molding

machine that processes a heated thermoplastic resin parison that has descended parison zones of substantially different wall thickness to form a blow-molded hollow thermoplastic resin product, and wherein said gutter flash receiver element further comprises an elongated and continuous blind-slot whose surface opening width and or depth varies generally directly in proportion to the wall thickness of the nearest blow-mold machine descended parison zone.

17. The blow-mold assembly invention defined by claim 6, and wherein said bi-directional actuators comprise an independently-controlled, extendable and retractable actuator, each said independently-controlled, extendable and retractable actuator being connected to a different one of said multiple elongate gutter plate segment pivot connections.

18. The blow-mold assembly invention defined by claim 17, and additionally comprising a programmable sequence controller that is controllably connected to each said extendable and retractable actuator, and that is programmed with respect to each said base blow-mold sub-assembly elongate gutter plate segment to sequentially pivot the base blow-mold sub-assembly elongate gutter plate segment first about one of its said two pivot connections and afterwards about the other of its said two pivot connections.

19. The blow-mold assembly invention defined by claim 6, further comprising at least one coolant passage formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

20. The blow-mold assembly invention defined by claim 6, further comprising a recessed

section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

5           21. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold sub-assembly, and comprising:

10               a cap blow-mold sub-assembly having a product cavity that is defined in-part by a mold parting-line perimeter, and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping surface extending outwardly from said product cavity mold parting-line perimeter;

15               a base blow-mold sub-assembly having a support structure, and having a product cavity that is carried by said support structure and that is defined in-part by a mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

20               multiple base blow-mold sub-assembly elongate gutter plate segments that are each pivotable and movable relative to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-abutted, that each have two, spaced-apart pivot connections each of which is positioned in a different one of the elongate gutter plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface;

              a controlled bi-directional gutter plate segment drive that is actuated to cause pivoting of each said elongate gutter plate segments in directions away from said base blow-mold sub-assembly



product cavity mold parting-line perimeter to separate the product surrounding gutter flash from the product progressively along said base blow-mold sub-assembly product cavity mold parting line perimeter,

said multiple elongate gutter plate segment pivot connections each having a longitudinal pivot axis oriented normal to the plane of said base blow-mold sub-assembly mold parting-line perimeter, said two pivot connections in each elongate gutter plate segment each permitting its incorporating elongate gutter plate segment to be translated linearly in directions that are parallel to said gutter plate segment pivot connection longitudinal axis, one of said two pivot connections in each elongate gutter plate segment being translatable linearly and the other of said two pivot connections in each elongate gutter plate segment being non-translatable linearly in directions that are parallel to the plane of said base blow-mold sub-assembly product cavity mold parting line perimeter, and said controlled bi-directional gutter plate segment drive being operably connected only to those of said multiple elongate gutter plate segment two pivot connections which are translatable linearly in directions that are parallel to the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter.

22. The blow-mold assembly invention defined by claim 21, and wherein said cap blow-mold sub-assembly gutter flash clamping surface comprises a substantially flat and continuous gutter flash clamping surface extending outwardly away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter with increasing gutter flash clamping surface angular departure away from said elongate gutter plate segment gutter flash clamping surfaces.

23. The apparatus invention defined by claim 22, and wherein said cap blow-mold sub-

assembly substantially flat gutter flash clamping surface increasing surface angular departure is at least approximately one degree ( $1^{\circ}$ ) or greater.

24. The apparatus invention defined by claim 21, and wherein said cap blow-mold sub-assembly gutter flash clamping surface comprises an otherwise substantially flat and continuous gutter flash clamping surface that has an intermediate offset step and that extends away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter with increasing gutter flash clamping surface angular departure away from said multiple elongate gutter plate segment gutter flash clamping surfaces.

25. The blow-mold assembly invention defined by claim 21, and further comprising at least one transverse gutter flash separation blade element, one of said base blow-mold sub-assembly end-abutting gutter plate segments having a transverse gutter flash separation blade element located in an end region that is adjacent the end region of another of said elongate gutter plate segments.

26. The blow-mold assembly invention defined by claim 21, and wherein said multiple base blow-mold sub-assembly elongate gutter plate segments each have an excess gutter flash receiver element that is recessed in and open relative to the gutter plate segment gutter flash clamping surface.

27. The blow-mold assembly invention defined by claim 26, and wherein said elongate gutter plate segment excess gutter flash receiver elements are each comprised of multiple blind-hole recesses provided in a respective one of said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

28. The blow-mold assembly invention defined by claim 26, and wherein said elongate gutter plate segment excess gutter flash receiver elements are each comprised of an elongate and continuous blind-slot that is recessed in a respective one of said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

5 29 The blow-mold assembly invention defined by claim 28, wherein said elongate gutter plate segment excess gutter flash receiver elements have a surface opening configuration that is uniformly spaced-apart from and parallels the configuration of the adjacent portion of said base blow-mold sub-assembly product cavity mold parting-line perimeter.

30. The blow-mold assembly invention defined by claim 26 for use in a blow-molding machine that processes a heated thermoplastic resin parison that has descended parison zones of substantially different wall thickness to form a blow-molded hollow thermoplastic resin product, and wherein said elongate gutter plate excess gutter flash receiver elements each further comprise multiple blind-hole recesses that have a gutter flash clamping surface volume that varies generally directly in proportion to the wall thickness of the nearest blow-mold machine descended parison zone.

15 31. The blow-mold assembly invention defined by claim 26 for use in a blow-molding machine that processes a heated thermoplastic resin parison that has descended parison zones of substantially different wall thickness to form a blow-molded hollow thermoplastic resin product, and wherein said elongate gutter plate segment excess gutter flash receiver elements each further  
20 comprises an elongated and continuous blind-slot whose surface opening width and or depth varies generally directly in proportion to the wall thickness of the nearest blow-mold machine descended parison zone.

32. The blow-mold assembly invention defined by claim 21, further comprising at least one coolant passage formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

5

33. The blow-mold assembly invention defined by claim 21, further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

34. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold assembly, and comprising:

15 a cap blow-mold sub-assembly having support structure, and having a product cavity that is carried by said cap blow-mold sub-assembly support structure and that is defined in part by a mold parting-line perimeter;

multiple cap blow-mold sub-assembly elongate gutter plate segments that are each pivotally connected and movable relative to said cap blow-mold sub-assembly support structure, that together surround said cap blow-mold sub-assembly product cavity mold parting-line perimeter when end-abutted, that each have a gutter flash clamping surface extending outwardly and away from said cap blow-mold sub-assembly product cavity mold

parting-line perimeter; and that each have multiple convex or concave cleat elements;

5 a base blow-mold sub-assembly having support structure, and having a product cavity that is carried by said base blow-mold sub-assembly support structure and that is defined in-part by a cavity mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

multiple base blow-mold sub-assembly elongate gutter plate segments that are each pivotally connected and movable relative to said base blow-mold sub-assembly support structure, that together completely surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-butted, that each have two, spaced-apart pivot connections each one of which is positioned in a different one of the elongate gutter plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from a respective one of said cap blow-mold sub-assembly elongate gutter plate segment gutter flash clamping surfaces,

10 a bi-directional gutter plate segment drive carried by said base blow-mold assembly support structure and co-operably connected to said multiple base blow-mold sub-assembly elongate gutter plate segments; and

15 guide pin elements provided in one of said cap blow-mold assembly multiple elongate gutter plate segments and said base blow-mold sub-assembly multiple elongate gutter plate segments; and

20 guide pin receptacle elements provided in the other of said cap blow-mold assembly multiple elongate gutter plate segments and said base blow-mold sub-assembly multiple elongate gutter plate segments and co-operating with said guide pin elements,

said co-operating guide pin and guide pin receptacle elements causing said cap blow-mold sub-assembly multiple elongate gutter plate segments and said base blow-mold sub-assembly multiple elongate gutter plate segments to be pivoted simultaneously when said bi-directional gutter plate segment drive is actuated to pivot said base blow-mold sub-assembly multiple abutting gutter plate segments and thereby progressively separate integrally attached gutter flash from the product .

35. The blow-mold assembly invention defined by claim 34, and further comprising at least one bi-directionally movable product ejector element and at least one bi-directionally movable air injection needle element, said bi-directionally movable air injection needle element being extendable into and retractable from one of said cap and base blow-mold sub-assembly product cavities, and said bi-directionally movable product ejector elements being extendable into and retractable from one of said cap and base blow-mold sub-assembly product cavities.

36. The blow-mold assembly invention defined by claim 34, and wherein said cap blow-mold sub-assembly elongate gutter plate segment gutter flash clamping surfaces each comprise a substantially flat and continuous surface extending outwardly from said cap blow-mold sub-assembly product cavity mold parting-line perimeter and with increasing gutter flash clamping surface departure away from said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

37. The blow-mold assembly invention defined by claim 36, and wherein said cap blow-mold sub-assembly substantially flat gutter flash clamping surface increasing surface departure is at least approximately a one-degree ( $1^{\circ}$ ) or greater departure.

38. The blow-mold assembly invention defined by claim 34, further comprising an excess gutter flash receiver element that is recessed in and open relative to one of said cap or said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

5

39. The blow-mold assembly invention defined by claim 34, further comprising cleat elements projecting convexly from or concavely into one of said cap or said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

40. The blow-mold assembly invention defined by claim 34, and wherein each said cap blow-mold sub-assembly gutter plate segment gutter flash clamping surface comprises an otherwise substantially flat and continuous gutter flash clamping surface that has an intermediate offset step and that extends away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter with increasing gutter flash clamping surface departure away from said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

15

41. The blow-mold assembly invention defined by claim 34 further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

20

42. The blow-mold assembly invention defined by claim 34 further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter

plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

43. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold assembly, comprising:

a cap blow-mold sub-assembly having a product cavity that is defined in-part by a cavity mold parting-line perimeter, and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping surface extending outwardly from said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

a base blow-mold sub-assembly having a support structure, and having a product cavity defined in-part by a cavity mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

multiple elongate gutter plate segments that are each pivotally connected to and supported by said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when abutted, that each have a pivot connection near each gutter plate segment end region, that each have a gutter flash clamping surface extending outwardly from said base blow-mold sub-assembly product cavity mold parting-line perimeter; and

crash pad element formed integrally with said multiple elongate gutter plate segments, projecting from said elongate gutter plate segment gutter flash clamping surfaces toward said



cap blow-mold sub-assembly gutter flash clamping surface, and spaced-apart from each other at opposed sides of said base blow-mold sub-assembly by a distance which exceeds the width of said mold cavity;

5 said multiple crash pad elements each contacting said cap blow-mold sub-assembly gutter flash clamping surface to establish the desired separation between said cap and base blow-mold sub-assembly product cavity mold parting line perimeters when said base and cap blow-mold sub-assemblies are operationally closed, thereby determining the thickness of gutter flash surrounding said base and cap blow-mold sub-assembly product cavity mold parting-line perimeters and further determining the wall thickness and the interior surface configuration characteristic of the product at the product mold parting-line perimeter.

44. The blow-mold assembly invention defined by claim 43, further comprising an excess gutter flash receiver element formed in said elongate gutter plate segments.

15 45. The blow-mold assembly invention defined by claim 44, and wherein said excess gutter flash receiver elements are each comprised of multiple blind-hole recesses provided in a respective one of said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

20 46. The blow-mold assembly invention defined by claim 44, and wherein said excess gutter flash receiver elements are each comprised of an elongated and continuous blind-slot that is recessed in a respective one of said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces.

47. The blow-mold assembly invention defined by claim 44 for use in a blow-molding machine that processes a heated thermoplastic resin parison that has descended parison zones of substantially different wall thickness to form a blow-molded hollow thermoplastic resin product, and wherein said gutter flash receiver elements each further comprise multiple blind-hole recesses that have a gutter plate segment gutter flash clamping surface volume that varies generally directly in proportion to the wall thickness of the nearest blow-mold machine descended parison zone.

48. The blow-mold assembly invention of claim 44 for use in a blow-molding machine that processes a heated thermoplastic resin parison that has descended parison zones of substantially different wall thickness to form a blow-molded hollow thermoplastic resin product, and wherein said gutter flash receiver elements each further comprise an elongated and continuous blind-slot whose surface opening width and or depth varies generally directly in proportion to the wall thickness of the nearest blow-mold machine descended parison zone.

49. The blow-mold assembly invention defined by claim 43, wherein said cap blow-mold sub-assembly is further comprised of guide pin receiver elements located in said cap blow-mold sub-assembly gutter flash clamping surface, and wherein said elongate gutter plate segments are each further comprised of extendable and retractable guide pin elements, said extendable and retractable guide pin elements each projecting through an integrally formed crash pad element and into cooperation with a respective one of cap blow-mold sub-assembly gutter flash clamping surface guide pin receivers.

50. The apparatus invention defined by claim 43, wherein said cap blow-mold sub-assembly gutter flash clamping surface comprises a substantially flat and continuous surface extending outwardly away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter and with increasing gutter flash clamping surface departure away from said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces, and wherein said cap blow-mold sub-assembly gutter flash clamping surface is positioned interiorly of an adjacent one of said crash pad elements.

51. The blow-mold assembly invention defined by claim 50, and wherein said cap blow-mold sub-assembly substantially flat gutter flash clamping surface increasing surface departure is at least approximately one-degree ( $1^\circ$ ).

52. The blow-mold assembly invention defined by claim 43, wherein said cap blow-mold sub-assembly gutter flash clamping surface comprises an otherwise substantially flat and continuous gutter flash clamping surface that has an intermediate offset step and that extends away from said cap blow-mold sub-assembly product cavity mold parting-line perimeter with increasing gutter flash clamping surface departure away from said base blow-mold sub-assembly gutter plate segment gutter flash clamping surfaces, and wherein said cap blow-mold sub-assembly gutter flash clamping surface is positioned interiorly of an adjacent one of said crash pad elements.

53. The blow-mold assembly invention defined by claim 43 further comprising coolant

passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

54. The blow-mold assembly invention defined by claim 43 further comprising a recessed  
5 section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

55. A blow-mold assembly for use in a blow-molding machine which processes a heated  
thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally  
10 attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold assembly, comprising:

a cap blow-mold sub-assembly having a product cavity that is defined in-part by a cavity mold  
parting-line perimeter and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping  
15 surface extending outwardly from said product cavity mold parting-line perimeter;

a base blow-mold sub-assembly having a support structure, and having a product cavity that  
is carried by said support structure and that is defined in-part by a cavity mold parting-line perimeter  
corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

two elongate gutter plate segments that are each pivotally connected to and movable relative  
20 to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-butted, that each have two pivot connections, each of said two pivot connections being located in a different one of the elongate gutter

plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface;

a bi-directional gutter plate segment drive that is carried by said base blow-mold sub-assembly support structure, that is co-operably connected to said base blow-mold sub-assembly gutter plate segments, and that is actuated to cause pivoting of each said base blow-mold sub-assembly elongate gutter plate segment relative to said base blow-mold sub-assembly product cavity mold parting-line perimeter in directions away from said base blow-mold sub-assembly product cavity mold cavity parting-line perimeter to separate integrally attached gutter flash from the product progressively along said base blow-mold sub-assembly product cavity mold cavity parting-line perimeter, said elongate gutter plate segment pivot connections each having a longitudinal pivot axis oriented normal to the plane of said base blow-mold sub-assembly product cavity mold cavity parting-line perimeter, and each said elongate gutter plate segment pivot connection permitting its co-operating elongate gutter plate segment to be translated linearly in directions parallel the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter when separating integrally attached gutter flash from the product progressively along said base blow-mold sub-assembly product cavity mold cavity parting-line perimeter.

56. The blow-mold assembly invention defined by claim 55, and wherein said bi-directional gutter plate segment drive is comprised of two, independently-controlled, linearly extendible and retractable, actuator devices, and of two linearly extendible and retractable double-slotted wedging cams that are each connected to a different one of said two linearly extendible and retractable actuator devices, each of said two linearly extendible and retractable double-slotted wedging cams co-

operating with a different pair of said two gutter plate segment pivot connections located in adjacent elongate gutter plate segment end regions.

5 57. The blow-mold assembly invention defined by claim 56, and additionally comprising a programmable sequence controller that is controllably connected to said bi-directional gutter plate segment drive two extendable and retractable actuator devices, and that is programmed with respect to said two linearly extendable and retractable double-slotted wedging cams to sequentially first extend one of said double-slotted wedging cams and afterwards extend the other of said two double-slotted wedging cams to thereby pivot said gutter plate segments to progressively separate surrounding gutter flash from the thermoplastic resin product.

58. The blow-mold assembly invention defined by claim 55, and wherein said bi-directional gutter plate drive is comprised of a linearly extendible and retractable actuator device, of a bi-directionally rotated and double-slotted drive cam that is rotated by said linearly extendible and retractable actuator device, and of two, linearly extendible and retractable, double-slotted wedging cams that each co-operate with two of said gutter plate segment pivot connections located in a different pair of elongate gutter plate segment adjacent end regions, said bi-directionally rotated double-slotted drive cam having two spaced-apart drive slots that each co-operated with a different one of said linearly extendible and retractable double-slotted wedging cams, and sequentially extending said co-operating two, linearly extendible and retractable, double-slotted wedging cams to thereby progressively separate surrounding gutter flash from the thermoplastic resin product.

59. The blow-mold assembly invention defined by claim 55 further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

60. The blow-mold assembly invention defined by claim 55 further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

61. In a method of separating integrally-attached gutter flash from a hollow molded product having a product surrounding mold parting line perimeter and a product interior mold parting-line

perimeter interior, the steps of:

forming, from a heated thermoplastic resin parison, a blow-molded product having an exterior, integrally-attached gutter flash extending away from the product surrounding mold parting line;

5 forming, from said heated thermoplastic resin parison, a blow-molded gutter flash core extending to the product interior mold parting-line perimeter and having an integral elongate bellows void;

progressively separating said blow-molded product exterior, integrally-attached gutter flash from said blow-molded product, and

10 collapsing said blow-molded gutter flash core integral elongate bellows void to thereby separate said gutter flash core from said blow-molded product.

62. The method invention defined by claim 61, and wherein said steps of progressively separating said blow-molded product exterior, integrally-attached gutter flash from said blow-molded  
15 product, and of collapsing said gutter flash core integral elongate bellows void to thereby separate said gutter flash core from said blow-molded product are accomplished simultaneously.

63. The method invention defined by claim 61, and wherein said step of collapsing said blow-  
20 molded gutter flash core integral elongate bellows void to thereby separate said gutter flash core from said blow-molded product is accomplished progressively along the length of said gutter flash core elongate bellows void.



64. In a blow-mold assembly which processes a heated thermoplastic resin parison to form a hollow blow-molded thermoplastic resin product having an interior through-opening mold parting-line perimeter and having an integrally-attached gutter flash core that extends to the product interior through-opening mold parting-line perimeter, and which separates the integrally-attached gutter flash core from the hollow blow-molded product while that product is retained in the blow-mold assembly, in combination:

a cap blow-mold sub-assembly having an interior gutter flash core clamping surface that extends to the product interior through-opening mold parting-line perimeter and having an elongate bellows void cavity recessed in said interior gutter flash core clamping surface;

a base blow-mold sub-assembly having a support structure, having a bellows block carried by said support structure, and having an elongate bellows void cavity recessed in said bellows block in registration with said cap blow-mold sub-assembly elongate bellows void cavity;

two base blow-mold sub-assembly gutter plate segments that are each pivoted relative to said base blow-mold sub-assembly support structure and the product interior through-opening mold parting-line perimeter, that extend to the product interior through-opening mold parting-line perimeter and are separated from each other by an elongate bellows gap registering with said cap and base blow-mold sub-assembly elongate bellows void cavities, that each have two pivot connections each one of which is located adjacent a different end of the elongate bellows gap separating said gutter plate segments, that each have a gutter

flash core clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly interior gutter flash core clamping surface;

a bi-directional gutter plate segment drive that is carried by said base blow-mold sub-assembly support structure, that is co-operably connected to said base blow-mold sub-assembly gutter plate segments, and that is actuated to cause pivoting of each said base blow-mold sub-assembly gutter plate segment relative to said base blow-mold sub-assembly support structure and the product interior through-opening mold parting-line perimeter to separate the integrally attached gutter flash core from the product progressively along the product interior through-opening mold parting-line perimeter,

said gutter plate segment pivot connections each having a longitudinal pivot axis oriented normal to the plane of the product interior through-opening mold parting-line perimeter, and each said gutter plate segment pivot connection permitting its co-operating gutter plate segment to be rotated in directions parallel to the plane of the product interior through-opening mold parting-line perimeter when separating the integrally-attached gutter flash core from the product along the product interior through-opening mold parting-line perimeter.

65. The blow-mold assembly invention defined by claim 64, and wherein said cap blow-mold sub-assembly interior gutter flash core clamping surface comprises a substantially flat and continuous surface extending away from said cap blow-mold sub-assembly product interior through-cavity mold parting-line perimeter and with increasing gutter flash clamping surface departure away from said base blow-mold sub-assembly two gutter plate segment gutter flash clamping surfaces.

66. The blow-mold assembly invention defined by claim 65, and wherein said cap blow-mold sub-assembly substantially flat and continuous interior gutter flash core clamping surface increasing surface departure is at least approximately a one-degree (1°) or greater angular departure.

5 67. The blow-mold assembly invention defined by claim 64, and wherein said cap blow-mold sub-assembly interior gutter flash core clamping surface comprises an otherwise substantially flat and continuous interior gutter flash core clamping surface that has an intermediate offset step and that extends away from said cap blow-mold sub-assembly product interior through-opening mold parting-line perimeter with increasing interior gutter flash core clamping surface angular departure away from  
10 said base blow-mold sub-assembly gutter plate segment gutter flash core clamping surfaces.

68. The blow-mold assembly invention defined by claim 64 wherein each gutter plate segment has an excess gutter flash receiver element that is recessed in and open relative to said gutter plate segment gutter flash core clamping surface.  
15

69. The blow-mold assembly invention defined by claim 68, and wherein said excess gutter flash receiver elements are each comprised of multiple blind-hole recesses provided in a respective one of said base blow-mold sub-assembly gutter plate segment interior gutter flash core clamping surfaces.  
20

70. The blow-mold assembly invention defined by claim 68, and wherein said excess gutter flash receiver elements are each comprised of an elongated and continuous blind-slot that is recessed

in a respective one of said base blow-mold sub-assembly gutter plate segment interior gutter flash core clamping surfaces .

71. The blow-mold assembly invention defined by claim 64, further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

72. The blow-mold assembly invention defined by claim 64, further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

73. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally-attached gutter flash surrounding the product and an integrally-attached interior gutter flash core, and to progressively separate the surrounding gutter flash and interior gutter flash core from the product while the product is retained in the blow-mold assembly, comprising:

a cap blow-mold sub-assembly having a product cavity that is defined in-part by a product cavity mold parting-line perimeter and that is surrounded by a cap blow-mold sub-assembly exterior gutter flash clamping surface extending outwardly from said product cavity mold parting-line perimeter, and having an interior gutter flash core clamping surface that is defined by a product interior through-opening mold parting-line perimeter and that has an elongate bellows void cavity recessed in said interior gutter flash core clamping surface;

a base blow-mold sub-assembly having a support structure, having a product cavity that is carried by said support structure and that is defined in-part by a product cavity mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter, having a bellows block carried by said support structure, and having an elongate bellows void cavity recessed in said bellows block in registration with said cap blow-mold sub-assembly elongate bellows void cavity;

two elongate exterior gutter plate segments that are each pivotally connected to and movable relative to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-buttet, that each have two pivot connections, each of said two pivot connections being located in a different one of the elongate gutter plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface;

two interior gutter plate segments that are each pivoted relative to said base blow-mold sub-assembly support structure and the product interior through-opening mold parting-line perimeter, that extend to the product interior through-opening mold parting-line perimeter and are separated from each other by an elongate bellows gap registering with said cap and base blow-mold sub-assembly elongate bellows void cavities, that each have two pivot connections each one of which is located adjacent a different end of the elongate bellows gap separating said gutter plate segments, that each have a gutter flash core clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly interior gutter flash core clamping surface, and

a bi-directional gutter plate segment drive that is carried by said base blow-mold sub-assembly support structure, that is co-operably connected to said base blow-mold sub-assembly exterior and interior gutter plate segments, and that is actuated to cause pivoting of each said base blow-mold sub-assembly exterior or interior gutter plate segment;

5 said elongate gutter plate segment pivot connections and said interior gutter plate segment pivot connections each having a longitudinal pivot axis oriented normal to the plane of said base blow-mold sub-assembly product cavity mold cavity parting-line perimeter, and each said exterior elongate gutter plate segment pivot connection or said interior gutter plate segment pivot connection permitting its respective co-operating gutter plate segment to be translated linearly in directions parallel to the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter when separating integrally-attached surrounding gutter flash and interior gutter flash core from the blow-molded product progressively along said base blow-mold sub-assembly product cavity mold cavity parting-line perimeter and along said base blow-mold sub-assembly product interior through-opening mold parting-line perimeter while the blow-molded product is retained in the blow-mold assembly.

15

74. The blow-mold assembly invention defined by claim 73, further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

20

75. The blow-mold assembly invention defined by claim 73, further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said

product.

76. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold sub-assembly, and comprising:

a cap blow-mold sub-assembly having a product cavity that is defined in-part by a mold parting-line perimeter, and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping surface extending outwardly from said product cavity mold parting-line perimeter;

a base blow-mold sub-assembly having a support structure, and having a product cavity that is carried by said support structure and that is defined in-part by a mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

multiple base blow-mold sub-assembly elongate gutter plate segments that are each pivotable and movable relative to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-abutted, that each have two, spaced-apart pivot connections each of which is positioned in a different one of the elongate gutter plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface;

a controlled bi-directional gutter plate segment drive that is actuated to cause pivoting of each said elongate gutter plate segments in directions that do not intersect the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter to separate the product surrounding gutter flash from the product progressively along said base blow-mold sub-assembly product cavity mold parting-line perimeter;

ejector pin elements provided in at least one of said base blow-mold assembly multiple elongate gutter plate segments;

a multi-ramp slide member mounted on at least one of said elongate gutter plate segments;

each ejector pin element engaging one ramp of said multi-ramp slide member;

5 bi-directional ramp slide member actuator movable between one and another positions wherein said ejector pins are extended outwardly of said gutter flash clamping surface when said actuator is in said one said positions and wherein said ejector pins are retracted inwardly of said gutter flash clamping surface when said actuator is in said other positions.

10 77. The blow-mold assembly invention defined by claim 76 further comprising a biasing element operatively connected to each of said ejector pin elements and biasing said ejector pin elements into contact with its respective multi-ramp slide member ramp.

15 78. The blow-mold assembly invention defined by claim 76 further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

20 79. The blow-mold assembly invention defined by claim 76 further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.



80. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold sub-assembly, and comprising;

a cap blow-mold sub-assembly having a product cavity that is defined in-part by a mold parting-line perimeter, and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping surface extending outwardly from said product cavity mold parting-line perimeter;

a base blow-mold sub-assembly having a support structure, and having a product cavity that is carried by said support structure and that is defined in-part by a mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

multiple base blow-mold sub-assembly elongate gutter plate segments that are each pivotable and movable relative to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-abutted, that each have two, spaced-apart pivot connections each of which is positioned in a different one of the elongate gutter plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface;

a controlled bi-directional gutter plate segment drive that is actuated to cause pivoting of each said elongate gutter plate segments in directions that do not intersect the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter to separate the product surrounding gutter flash from the product progressively along said base blow-mold sub-assembly product cavity mold parting-line perimeter;

at least one extensible and retractable spacer elements mounted in said base blow-mold sub-assembly support structure beneath said elongate gutter plate segments;

a ramped slide member mounted in said base blow-mold sub-assembly having at least one ramp which receives said space elements;

5 a bi-directional actuator operatively connected to said ramped slide member and movable between one and another positions wherein in said one position said spacer element is extended and engages said elongate gutter plate segment to define the space between said cap blow-mold sub-assembly gutter flash clamping surface and said gutter plate segment gutter flash clamping surface.

81. The blow-mold assembly of claim 80 further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

82. The blow-mold assembly of claim 80 further comprising a recessed section formed in one  
15 of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.

83. A blow-mold assembly for use in a blow-molding machine which processes a heated thermoplastic resin parison to form a blow-molded thermoplastic resin product having integrally attached gutter flash surrounding the product, and to progressively separate the surrounding gutter flash from the product while the product is retained in the blow-mold sub-assembly, and comprising:

5 a cap blow-mold sub-assembly having a product cavity that is defined in-part by a mold parting-line perimeter, and that is surrounded by a cap blow-mold sub-assembly gutter flash clamping surface extending outwardly from said product cavity mold parting-line perimeter;

a base blow-mold sub-assembly having a support structure, and having a product cavity that is carried by said support structure and that is defined in-part by a mold parting-line perimeter corresponding to said cap blow-mold sub-assembly product cavity mold parting-line perimeter;

multiple base blow-mold sub-assembly elongate gutter plate segments that are each pivotable and movable relative to said base blow-mold sub-assembly support structure, that together surround said base blow-mold sub-assembly product cavity mold parting-line perimeter when end-abutted, that each have two, spaced-apart pivot connections each of which is positioned in a different one of the  
15 elongate gutter plate segment end regions, that each have a gutter flash clamping surface opposing and spaced-apart from said cap blow-mold sub-assembly gutter flash clamping surface;

a controlled bi-directional gutter plate segment drive that is actuated to cause pivoting of each said elongate gutter plate segments in directions that do not intersect the plane of said base blow-mold sub-assembly product cavity mold parting-line perimeter to separate the product surrounding  
20 gutter flash from the product progressively along said base blow-mold sub-assembly product cavity mold parting line perimeter;

at least one extensible and retractable crash pad element mounted in said base blow-mold sub-

assembly support structure beneath said elongate gutter plate segments;

a ramped slide member mounted in said base blow-mold sub-assembly having at least one ramp which receives one end of said crash pad element;

5 a bi-directional actuator operatively connected to said ramped slide member and operable to move said ramped slide member between one and another positions wherein in said one position said crash pad element projects beyond said gutter plate segment gutter flash clamp surface to engage a cap blow-mold crash pad and in said another position said crash pad element is retracted to a position beneath said elongate gutter plate segment.

10 84. The blow-mold assembly invention of claim 83 further comprising coolant passages formed in said elongate gutter plate segments adjacent said product cavity mold parting-line perimeter.

15 85. The blow-mold assembly invention of claim 83 further comprising a recessed section formed in one of said cap blow-mold sub-assembly gutter flash clamping surface or said gutter plate segment gutter flash clamping surface to provide a section of gutter flash attached to said product.